

REMARKS

Claims 8-14 are presently in the application. Claims 1-7 have been canceled.

Reconsideration of the rejection of claims 8-11 under 35 USC 103(a) as unpatentable over Regueiro (US 5,353,992) in view of Imura et al (US 5,022,372) is respectfully requested.

Applicants have invented a fuel injection valve for internal combustion engines having a more slender design compared to conventional fuel injection valves, but which maintains the necessary wall thickness between the spring chamber and the fuel inlet conduit. This is accomplished by reducing the dimensions of the inlet conduit in the radial direction while increasing the length of the conduit in the circumferential direction.

Independent claim 8 is directed to a fuel injection valve for internal combustion engines comprising, inter alia, a valve body part having a longitudinal axis and in which a central hollow chamber is embodied, an inlet conduit, which extends in the wall of the central hollow chamber parallel to the longitudinal axis of the valve body part, said inlet conduit in the circumferential direction having a greater length than in an at least approximately radial direction.

The examiner has determined that Regueiro shows all of the fuel injection valve structure recited in claim 8, except an inlet conduit in the circumferential direction having a greater length than in an at least approximately radial direction.

To solve this deficiency in Regueiro, the examiner cites Imura et al. as teaching a fuel delivery system comprising a rectangular fuel delivery passage. The examiner then concludes that it would have been obvious to have modified the device of Regueiro by providing inlet conduit (51) which in the circumferential direction having a greater length than in an at least approximately radial direction "as taught by Imura et al, since Imura et al teaches that such passage shapes are known in the art and the device of Regueiro would function properly with a fuel passage having such a shape."

However, Imura et al teaches a fuel delivery rail comprising an elongated conduit having a rectangular or square cross section. A fuel rail supplies fuel to an injection valve. It is not a fuel injection valve. There is no teaching or suggestion in Imura et al of an inlet conduit in a valve body part or any teaching or suggestion of making such an inlet conduit rectangular or square and orienting the conduit so that the inlet conduit has a greater length in the circumferential direction than in the radial direction of the valve body. What is actually disclosed by Imura et al is a fuel delivery rail having a rectangular or square hollow section. Imura is not concerned with the wall thickness of an injection valve and, in fact, has no teaching relevant to injection valve design.

Even if Imura were relevant to fuel injection valve design, Imura provides no teaching or suggestion of how the square or rectangular conduit would be oriented when combined with an injection valve body. Simply making Regueiro's conduit (51)

rectangular or square does not necessarily lead one to applicants' invention. One must also orient the rectangular passage such that the long side is in the circumferential direction of the valve body. Where is this teaching in the applied prior art? The answer is that it simply does not exist.

To establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). See, also, MPEP 2143.03. Neither Regueiro nor Imura et al teaches or suggests a fuel injection valve of the type recited in claim 8 in which the inlet conduit in the circumferential direction has a greater length than in an at least approximately radial direction. Accordingly, claim 8 is not rendered obvious by the combined teachings of Regueiro and Imura et al.

As to the specific shapes recited in claims 9-11, the examiner takes the position that the oval or elliptical shape of the inlet conduit is an obvious matter of design choice. The examiner is reminded that the applicants' specification has set forth specific advantages of an injection valve inlet conduit having an approximate oval or elliptical shape oriented in a specific manner relative to the longitudinal axis of the valve body, namely, it allows a fuel injection valve to be fabricated with a more slender design compared to conventional fuel injection valves while still maintaining the necessary wall thickness between the spring chamber and the fuel inlet conduit. No such teaching or suggestion exists in the applied prior art. Thus, the results

achieved by applicants' design were unexpected in the art and the specific shapes called for in claims 9-11 were not merely matters of design.

Reconsideration is also requested of the rejection of claims 12-14 under 35 USC 103(a) as unpatentable over Regueiro in view of Imura et al in combination with Muzslay (US 5,989,076).

Applicants' specification (page 8) teaches that the fuel inlet conduit of the invention can be produced by the following method: A bore which has a circular cross section is made eccentrically to a cylindrical body, which is solid and preferably comprises metal, the bore being at least approximately parallel to the longitudinal axis of the cylindrical body. The cylindrical body has an outer diameter that is greater than the predetermined value of the valve retaining body 1 to be produced. By mechanical machining, the cylindrical body is then plastically deformed, so that while maintaining its cylindrical shape of the outer jacket face or surface, it is reduced in diameter, until the predetermined value of the valve retaining body 1 to be produced is attained. As a result, the cross section of the inlet conduit 3 is changed as well and assumes an oval or elliptical cross-sectional contour. After this deformation, a central hollow chamber forming the spring chamber 5 is embodied in the valve retaining body 1, so that the inlet conduit 3 extends in the wall of the spring chamber 5. The plastic deformation of the cylindrical body is advantageously done by rolling of the cylindrical body, making a permanent plastic

reshaping of the cylindrical body possible while maintaining its cylindrical shape of the outer jacket face.

Independent claim 12 is directed to a method for producing a valve body comprising, inter alia, the step of "reducing the diameter of the body, while maintaining its at least approximately cylindrical shape, by plastic deformation, until a predetermined diameter is attained, and the cross section of the bore is changed in such a way that the cross section has a greater length in the circumferential direction than in the at least approximately radial direction."

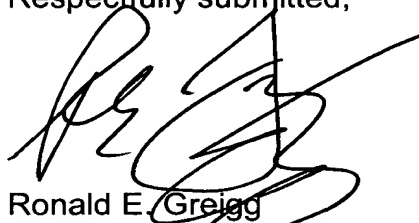
The examiner acknowledges that neither Regueiro nor Imura et al teaches or suggests a method for producing a valve body including the above identified step. According to the examiner, "Muzslay teaches the process of plastic deformation in order to shape a tube of a fuel injector." This is not a correct description of what is taught by Muzslay. Muzslay actually teaches a fuel injection housing and connector assembly 10 comprising a metal housing 12 and an injection molded plastic connector frame 14. In order to increase the strength of the connector frame, a metal brace 70 in the form of a sleeve is positioned in a cavity 32 in the metal housing before the plastic material is injected into the cavity to form the connector frame. There is no teaching of plastic deformation in Muzslay, much less a teaching of reducing the diameter of a cylindrical body, while maintaining its at least approximately cylindrical shape, by plastic deformation, until a predetermined diameter is attained, and the cross section of a bore in the cylindrical body is

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changed in such a way that the cross section has a greater length in the circumferential direction than in the at least approximately radial direction. Thus, all the claim limitations are not taught or suggested by the applied prior art. Therefore, claims 12-14 are not rendered obvious by the combined teaching of Regueiro, Imura et al and Muzslay.

In accordance with the foregoing, applicants respectfully request that the examiner reconsider and withdraw the outstanding rejections. If, however, the examiner feels that any further issues remain or require clarification, the examiner is cordially invited to contact the undersigned in order that any such issues may be promptly resolved.

Respectfully submitted,



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